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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,432	07/05/2005	Ermanno Filippi	9526-57 (172345)	6387

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EXAMINER	
BHAT, NINA NMN	

ART UNIT	PAPER NUMBER
1797	

NOTIFICATION DATE	DELIVERY MODE
08/18/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip@akerman.com

Office Action Summary	Application No.	Applicant(s)	
	10/541,432	FILIPPI ET AL.	
	Examiner	Art Unit	
	N. Bhat	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 11, 2009 has been entered.

2. Applicant has not amended the claims and the claims are in its original form as of the final rejection. The June 11, 2009 arguments presented in response to the Final rejection has been fully and carefully considered by the examiner and are not found persuasive. The rejection remains as set forth in the Final office action which will be repeated followed by the examiner's response to applicant's arguments.

3. Claims 1-4 are objected to because of the following informalities: In claim 1, applicant has used the term “speed” as well as heat exchange coefficient. These terms “speed” should be referred to as either the velocity of the fluid or flow rate of the fluid, which are conventionally used terms to one having ordinary skill in the art familiar with heat transfer phenomena. Further the term "heat exchange coefficient" again is not technically correct it is commonly referred to as heat transfer coefficient. Applicant has also used “characterized in that” language which is not commonly used in US practice and applicant is suggested to replace “characterized in that” with --wherein--. Appropriate correction is required. Applicant is reminded that this is not a requirement but merely a suggestion.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having

ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-4 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal, EP 0094208 in combination with Filippi et al., EP 1153653.

Agarwal teach the invention substantially as claimed. Specifically Agarwal teach a temperature controls system which controls the temperate of a reactor by controlling in flow lines and using parameters of known quantities for specific heat of the feed, the effluent and heat of vaporization and reaction to calculate a coolant flow rate set point. The system and method as taught by Agarwal includes a reactor having a feed line for reactant and an effluent line for the product, a feed flow transmitter connected to the feed line for measuring the reactant flow; a effluent flow transmitter which is connected to the effluent line for measuring the flow of product from the reactor; a feed temperature transmitter connected to the feed line for sensing the reactant temperature, and effluent temperature transmitter for measuring the product temperature. A reactor temperature transmitter which measures the temperature of the reactor, a concentration transmitter connected to the effluent line for measuring the concentration of product in the effluent line, a coolant flow line to the reactor for supplying coolant to the reactor at a coolant flow rate, a coolant flow control means and circuit means that connects to all of the transmitters and to the coolant flow control means for controlling the flow of coolant to the reactor according to the coolant flow signal which is connected to receive quantities proportional

to the heat of reaction for at least one reaction in the reactor, specific heats of the reactant and product and the heat of vaporization of the coolant.[Note the abstract, Page 3, line 1-30 and The heat and temperature and flow control algorithms as taught in Agarwal is fully capable of setting the speed of the heat exchange fluid inside the respective heat exchange within predetermined value so that the heat exchange coefficient inside the heat exchanger is less than the heat exchange coefficient in the catalytic bed.

However, Agarwal does not teach that the two heat exchanger is disposed within catalytic bed nor the specific relationship that the heat exchange coefficient inside the heat exchangers is equal to or less than 2/3 of the heat exchange coefficient inside the catalytic bed.

Filippi et al. '653 teach a fixed bed reactor for carrying out exothermic or endothermic reactions which includes a heat exchanger (9) embedded in a catalytic layer (10).[Note Paragraph[0023] Filippi et al. teach the construction arrangement of the heat exchangers within the reactor provides an isothermal reactor having high heat exchange degree that allows an optimum control of the temperature to the advantage of higher conversion yield and improved or lowered energy consumption. Filippi et al. teach that the high heat exchange efficiency inside the reactor allows recovering or supplying heat with smaller temperature differences between there reactant fluid and heating or cooling fluid. The construction and arranged provides a smaller gradient of temperature inside the catalytic layer between two adjacent heat exchange plates thereby achieving a greater uniformity of temperature inside the catalytic layer.[Note [0030]]. The reactor as described by Filippi et al. is fully capable of carrying out chemical reactions in pseudo-isothermal conditions.

It would have been obvious from the combined teachings of Agarwal and Filippi et al. to provide a temperature control system which is capable of adjusting the temperature inside a reaction zone of a catalytic reactor, includes probes/sensors for measuring the temperature

between zones between the heat exchanger surface and catalyst and being capable of controlling the flow rate of the fluids inside the heat exchanger thereby modifying the heat exchange coefficient. It is maintained that the control system and algorithms described by Agarwal is capable of controlling the reaction temperature in a catalytic bed of a reactor in which the exchange is carried out so as to allow the transfer of the larges possible amount of heat between operating fluid and catalytic bed and maximizing the heat exchange coefficient inside the exchangers. Agarwal specifically teach sensing input and output streams, flow streams within the reactor and within the heat exchanger and manipulating the heat exchange fluid streams which provides conditions within the reactor to maximize and optimize the yield of reaction and reaction conditions. To use the control system in a reactor taught by Filippi wherein the reactor is specifically designed to operate under isothermal conditions which includes a fixed bed reactor, the heat exchangers disposed within the reactor and wherein the conditions of the reactor are controlled so that chemical reaction takes place in a pseudo isothermal conditions wherein the heat exchanger is crossed by a respective operating fluid immersed in the catalytic bed renders applicant's invention as a whole obvious and a permissible substitution to one having ordinary skill in the art at the time the invention was made.

7. In the response of September 4, 2008, applicant has argued that the temperature control of Agarwal is totally different in nature than claimed in claim 1 wherein the reaction temperature is controlled by means of heat exchanger immersed in a catalytic bed. Applicant is arguing each reference singularly not what the combination of what the references teach. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,*

800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Specifically, the reactor which includes the two heat exchangers disposed within the catalytic bed is taught by Filippi et al. Filippi et al. further teach operating the reactor under isothermal conditions which would require the heat transfer coefficient to be adjust because the temperatures within the reactor are being controlled. Agarwal teaches the concept of adjusting the temperature inside a reaction zone and provides the teaching of providing a probe (probes) for continuously measuring the temperature difference between different zones within the reactor and then correlating and this data and adjusting accordingly.

Because the heat transfer coefficient is defined by

$$h = \Delta Q/A \cdot \Delta T \cdot \Delta t$$

where

ΔQ = heat input or heat lost, J
h = heat transfer coefficient, W/(m^{2}K)
A = heat transfer surface area, m^2
ΔT = difference in temperature between the solid surface and surrounding fluid area, K
Δt = time period, s

From the above equation, the heat transfer coefficient is the proportionality coefficient between the heat flux, $Q/(A\Delta t)$, and the thermodynamic driving force for the flow of heat (i.e., the temperature difference, ΔT).

The reactors of Filippi et al. is constructed and arranged such that the reactor operates in isothermal conditions which means that the reactor will operate in which the temperature of the system remains constant. The heat transfer into or out of the system typically must happen at such a slow rate that the thermal equilibrium is maintained. In such cases, the heat transfer coefficient would be adjusted such that equilibrium or heat transfer is maintained in order to keep the temperature of the system constant. It is therefore maintained that as claimed applicant's method and apparatus is rendered obvious to one having ordinary skill in the art at the time the invention was made.

8. In the June 11, 2009 response to the Final Office action, applicant has argued that Claim 1 is patentable over the combined teachings of Agarwal and Filippi et al. and applicant argues that "it is the phase change that determines the heat exchange coefficient between the heat exchange fluids and the reactants...and it is not technically correct to state that in the system according to Agarwal the speed of the heat exchange fluid coolant can influence the heat exchange coefficient. The examiner respectfully disagrees with applicant because the phase change is immaterial to the overall heat transfer coefficient, heat transfer coefficients are related to the Nusselt Number, Prandtl Number and Reynolds number, and related to the velocity of the fluid, the viscosity of the fluid, the diameter of the heat exchanger tubes etc. The phase of the fluid hardly affects the overall heat transfer coefficients. In Agarwal, the reference teaches how one would arrive at the heat flux which is related to the heat transfer coefficient. Even if applicant maintains the phase change argument, Agarwal teaches what is measured and how one would calculate the heat flux, the parameters as well as controlling the reactor temperature. The reactor design which immerses a heat exchanger in the reactor is taught in Filippi the reactor of Filippi is controlled so that it operates in nearly isothermal conditions and includes temperature control. To use the temperature control such as taught in Agarwal can be used as a model for what is required in controlling a reactor as claimed. Specifically all of the parameters used in Agarwal's heat flux computations and temperature control can be used in either a Dittus-Boelter Equation or Sieder -Tate Equation which are notoriously well known equations used in determining heat transfer coefficients and would be known to the artisan familiar in chemical/mechanical reactor design and engineering. The equations use the measurable parameters taught in Agarwal and can be used to empirically calculate the Reynolds number, Nusselt Number, Prandtl number based on the velocity of flow rate dimension of the tubes of the heat exchanger and the reactor surface dimensions and can arrive

at the heat transfer coefficient and therefore the would be no undue experimentation to arrive at applicant's relationship of the heat transfer coefficient inside of the heat exchanger to be less than the heat transfer coefficient in the catalytic bed from the combined teachings of Agarwal and Filippi et al. absent criticality in showing.

9. This is a RCE of applicant's earlier Application No. 10/541,432. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Bhat whose telephone number is 571-272-1397. The examiner can normally be reached on Monday-Friday, 9:30AM-6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. Bhat/
Primary Examiner, Art Unit 1797